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PATENT



Re: Application : Roger A. Grey et al  
Serial No : 10/770,924  
Filed : 02/03/2004  
For : Epoxidation Process Using A Mixed Catalyst System

Case No. : 01-2623A  
Unit No : 1625  
Examiner : R. K. Covington

Enclosed are the following documents related to the above-identified application:

- (X) Return Receipt of Postcard  
(X) Certificate of Mailing
- ( ) Declaration Under 37 C.F.R. § 1.131  
( ) Declaration Under 37 C.F.R. § 1.132  
( ) Terminal Disclaimer 37 C.F.R. § 1.321(c)  
( ) Notice of Appeal  
( ) Appeal Brief Under 37 C.F.R. § 1.192(d)  
( ) Version with Markings to Show Changes
- ( ) Assignment for Recordal  
( ) Information Disclosure Statement Under 37 C.F.R. § 1.97(b)(1), References, and Form PTO-1449  
( ) Amendment After Allowance 37 C.F.R. § 1.312  
( ) Response to Restriction Requirement  
( ) Two-Month Extension of Time Under 37 C.F.R. § 1.136 (fee noted below)  
( ) Amendment Under 37 C.F.R. § 1.121
- ( ) Issue Fee Transmittal  
( ) Certificate Under 37 C.F.R. § 3.73(b)  
( ) Request for Reconsideration  
(X) Reply Brief Under 37 C.F.R. § 41.41

The fee has been calculated as shown below:

**CLAIMS AS AMENDED**

	Claims Remaining After Amendment	Highest No. Previously Paid for	Present Extra	Rate	Add'l Fee
Total Claims:	minus	20	:	x \$50	0.00
Ind. Claims:	minus	3	:	x \$200	0.00
Fee for Petition of Extension of time	:	:	:	:	0.00
<b>TOTAL FEE DUE</b>				<b>\$</b>	<b>0.00</b>

- (X) No additional fee is required.
- ( ) Charge \$\_\_\_\_\_ to Deposit Account No. 01-2230. Two duplicate copies of this sheet are enclosed.
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June 25, 2007  
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01-2623A



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Roger A. Grey et al.

: Art Unit: 1625

Serial No.: 10/770,924

: Examiner: R. K. Covington

Filed: 2/3/04

For: EPOXIDATION PROCESS USING A MIXED CATALYST SYSTEM

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

REPLY BRIEF UNDER 37 C.F.R. § 41.41

I. Real Party in Interest

The real party in interest is Lyondell Chemical Technology, L.P., a subsidiary of Lyondell Chemical Company.

II. Related Appeals and Interferences

There are no other appeals or interferences known to Appellants, their representative, or assignee that will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. Status of the Claims

Claims 1-18 are pending in this application. Claims 1-18 have been rejected and are the subject of this appeal.

IV. Status of Amendments

There are no amendments filed subsequent to final rejection. Claims 1-18 on appeal are the originally filed claims. Claims 19-20 were cancelled in a prior response.

V. Summary of Claimed Subject Matter

The summary of claimed subject matter is found in the Appeal Brief filed on December 15, 2006.

VI. Grounds of Rejection to be Reviewed on Appeal

A. Are claims 1-18 obvious under 35 U.S.C. § 103(a) as unpatentable over Jones (U.S. Pat. No. 6,307,073) in view of Sato et al. (JP 4-352771)?

B. Are claims 1-18 obvious under 35 U.S.C. § 103(a) as unpatentable over Grey et al. (U.S. Pat. No. 6,498,259) in view of Bowman et al. (WO 98/00413)?

VII. New Ground of Rejection to be Reviewed on Appeal

Are claims 1-18 obvious under 35 U.S.C. § 103(a) as unpatentable over Jones (U.S. Pat. No. 6,307,073) in view of Sato et al. (JP 4-352771)?

A. Claims 1-18 are Nonobvious over Jones in view of Sato

1. Jones (U.S. Pat. No. 6,307,073) and Sato et al. (JP 4-352771)

Jones and Sato are discussed in the Appeal Brief filed on December 15, 2006.

2. The PTO Position: Appellants' Claimed Process is Obvious over Jones in view of Sato

In the Examiner's Answer of April 24, 2007, the Examiner lists a new ground of rejection: "Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jones US 6,307,073 in view of JP 4-352771" (see page 3, 3<sup>rd</sup> paragraph). However,

this rejection is not new but rather one of the two rejections that is currently under appeal.

The Examiner states that "Jones does disclose that is well known to use palladium as a catalyst component in epoxidation processes in order to promote the in-situ formation of oxidizing agents. See column 1 lines 41-46. In view of the art as a whole it would have been obvious to one of ordinary skill in the art to use palladium as an equivalent for the same purpose. An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious" (see page 4, 1<sup>st</sup> and 2<sup>nd</sup> paragraph).

Column 1, lines 41-46 of Jones specifically references JP 4-352771 (Sato), which appears to be the only reference to Sato in the new ground of rejection.

### 3. Appellants' Response

Appellants fail to see how the new ground of rejection differs from the ground of rejection previously presented in, for example, the Final Office Action of October 19, 2005 or the Office Action of February 23, 2005.

As Appellants have previously discussed in the Appeal Brief and prior Requests for Reconsideration, Jones teaches a catalyst mixture is different from the mixture required in the current claimed invention. Although both the present invention and Jones teach the presence of a palladium-free titanium zeolite (e.g., TS-1), Appellants require a palladium-containing titanium zeolite (e.g., Pd/TS-1) whereas Jones teaches the use of a supported gold catalyst (e.g., Au/TiO<sub>2</sub>).

Examiner again appears to argue that it would be obvious to substitute the Au/TiO<sub>2</sub> catalyst of Jones with the Pd/TS-1 catalyst of Sato. However, as previously discussed, Sato teaches (and it is well known in the art) that Pd/TS-1 by itself is an active catalyst in the epoxidation reaction of olefins with hydrogen and oxygen. Therefore, while it might be obvious to one of ordinary skill in the art to replace both TS-1 and Au/TiO<sub>2</sub> of Jones with the Pd/TS-1 catalyst of Sato since Pd/TS-1 accomplishes both purposes of the TS-1 and Au/TiO<sub>2</sub> mixture of Jones, it would not have been obvious to replace just the Au/TiO<sub>2</sub> of Jones with Pd/TS-1.

There is no suggestion that a combination of Pd/TS-1 and TS-1 would lead to an unexpected advantage compared to using Pd/TS-1 only in the epoxidation of olefins with hydrogen and oxygen. As seen in the current application, the mixture results in higher palladium productivity with the same, or slightly higher, PO/POE selectivity which can lead to economic savings by requiring the processing of less TS-1 in palladium incorporation. See the current application at page 10, I. 3-18.

VIII. Response to Examiner's Answer

In the Examiner's Answer of April 24, 2007, the Examiner states that "catalyst mixtures containing both palladium-free titanium zeolite and palladium-containing titanium zeolite are known in the art" (see page 4, 4<sup>th</sup> paragraph). Appellants disagree.

Although palladium-free titanium zeolites are known in the art and palladium-containing titanium zeolites are known in the art, mixtures of the two are not known in the art and the use of these mixtures would not have been obvious to one in the art since it is well known in the art that palladium-containing titanium zeolites, by themselves, are active in olefin epoxidation with hydrogen and oxygen. There is nothing in the prior art that would have suggested to those of ordinary skill in the art that they should use the required catalyst mixture in the claimed olefin epoxidation process, or would also have revealed the unexpected advantages described above and in the current application.

IX. Conclusion

For these reasons, in addition to those presented in the Appeal Brief of December 15, 2006, Appellants respectfully ask the Board of Patent Appeals and Interferences to reverse the Examiner's rejections of claims 1-18 under 35 U.S.C. § 103(a).

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Kevin M. Carroll  
Name of person signing

Kevin M. Carroll  
Signature

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Respectfully submitted,

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June 25, 2007  
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Claims Appendix

1. (original) A process for producing an epoxide comprising reacting an olefin, hydrogen and oxygen in the presence of a catalyst mixture comprising a palladium-containing titanium zeolite and a palladium-free titanium zeolite.

2. (original) The process of claim 1 wherein the palladium-containing titanium zeolite comprises palladium and a titanium silicalite.

3. (original) The process of claim 2 wherein the titanium silicalite is TS-1.

5. (original) The process of claim 1 wherein the palladium-containing titanium zeolite comprises palladium, a titanium zeolite, and a noble metal selected from the group consisting of platinum, gold, silver, iridium, rhenium, ruthenium, osmium, and mixtures thereof.

6. (original) The process of claim 4 wherein the noble metal is selected from the group consisting of platinum, gold, and mixtures thereof.

7. (original) The process of claim 1 wherein the palladium-containing titanium zeolite comprises from about 0.01 to about 10 weight percent palladium.

8. (original) The process of claim 1 wherein the palladium-free titanium zeolite is a titanium silicalite.

9. (original) The process of claim 1 wherein the palladium-free titanium zeolite is TS-1.

10. (original) The process of claim 1 wherein the olefin is a C<sub>2</sub>-C<sub>6</sub> olefin.

11. (original) The process of claim 1 wherein the olefin is propylene.

12. (original) The process of claim 1 wherein reaction of olefin, hydrogen and oxygen is performed in a solvent.

13. (original) The process of claim 11 wherein the solvent is selected from the group consisting of water, C<sub>1</sub>-C<sub>4</sub> alcohols, supercritical CO<sub>2</sub>, and mixtures thereof.

14. (original) The process of claim 11 wherein the solvent contains a buffer.

14. (original) A process comprising reacting propylene, hydrogen and oxygen in a solvent in the presence of a catalyst mixture comprising a palladium-containing titanium silicalite and palladium-free TS-1, wherein the palladium-containing titanium silicalite comprises palladium and a titanium silicalite.

15. (original) The process of claim **14** wherein the titanium silicalite is TS-1.
16. (original) The process of claim **14** wherein the palladium-containing titanium zeolite further comprises a noble metal selected from the group consisting of platinum, gold, silver, iridium, rhenium, ruthenium, osmium, and mixtures thereof.
17. (original) The process of claim **14** wherein the solvent is selected from the group consisting of water, C<sub>1</sub>-C<sub>4</sub> alcohols, supercritical CO<sub>2</sub>, and mixtures thereof.
18. (original) The process of claim **14** wherein the solvent contains a buffer.
19. (cancelled)
20. (cancelled)

Evidence Appendix

None

Related Proceedings Appendix

None